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DEVELOPING A LOCAL AND REGIONAL SOLID WASTE MANAGEMENT PLAN

ENVIRONMENTAL PROTECTION AGENCY

1973

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The basic features of the planning process and how to use them are described. Six major objectives of developing solid waste management plans are: (1) adopt a sound planning process; (2) establish a management system to implement optimum proposals for storage, collection, transportation, disposal, processing, and resource recovery; (3) apply the techniques and knowledge from the fast of organizational theory; (4) coordinate solid waste plans with other governmental agencies and further intergovernmental cooperation; (5) integrate the solid waste plan with comprehensive area-wide plans; (6) develop sound action programs with greatest promise for ultimate solution of solid waste problems.

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FOREWORD

A key function of the Federal solid waste management program mandated by the Solid Waste Disposal Act (Public Law 89-272) and its amendment, the Resource Recovery Act of 1970 (Public Law 91-512), is to encourage solid waste planning.

Local governments, particularly, should begin to plan and implement comprehensive systems to assure that their solid wastes are managed in a manner that does not create pollution or threaten the community health. Although the Federal and State governments should and do provide leadership, information, and assistance, the *real* effect of effective solid waste management—the daily programs of waste handling—falls to the local or, in many areas, the regional level.

The technical knowledge is available that will permit localities to adopt progressive solid waste practices and upgrade their solid waste management systems. Yet the great majority of these localities for a variety of reasons—most of them political, financial, and managerial, rather than technical—are not doing what we know how to do *now*, with today's technology. As a result, they are suffering from high costs, inability to finance adequate services, and environmental degradation. Or they are enmeshed in a web of overlapping and conflicting jurisdictions that hamstring solutions.

A well conceived plan and planned follow-through can be a strong force in overcoming institutional barriers. This guide contains recommendations for developing the local or areawide plan.

—ARNOLD L. DAMRAU

Acting Deputy Assistant Administrator
for Solid Waste Management
Office of Solid Waste Management Programs

PREFACE

Any activity developed best when it is well planned, and exploiting this axiom will allow us in solid waste management—at any level of government—to achieve better integration of our policies, programs, and expenditures.

This publication describes the basic features of the planning process and how a local or regional agency may use these in developing a solid waste management plan and in charting the way to early implementation of its plan. Because a variety of local or regional operating or planning agencies may be called upon to prepare solid waste management plans, the publication is approach is flexible. Each agency can be discretionary in adapting it to its own needs and special conditions.

All comprehensive solid waste management plans, however, should premise and pursue six objectives:

- Adopt a sound planning process.
- Establish a management system to implement optimum proposals for storage, collection, transportation, disposal, processing, and resource recovery.
- Apply the techniques and knowledge from the best of organizational theory, financial management, cost control, and the management sciences in general to solid waste management.
- Coordinate solid waste plans with other governmental agencies and further intergovernmental cooperation.
- Integrate the solid waste plan with comprehensive areawide plans.
- Develop sound action programs with greatest promise for ultimate solution of solid waste problems—conservation of resources, protection of the environment.

—CLYDE J. DOYAL, *Director*
Systems Management Division
Office of Solid Waste Management
Programs

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DEVELOPING A LOCAL & REGIONAL SOLID WASTE MANAGEMENT PLAN

PART ONE: THE PLANNING PROCESS

DEFINITION

Planning is the conscious process for achieving proposed objectives which rationally and fully considers any likely contingencies and alternatives. The planning process is a systematic method of: (1) recognizing that a negative situation or problem exists; (2) collecting and analyzing data about the situation or problem; (3) redefining the situation or problem in light of the analyzed data; (4) establishing objectives which, when achieved, will remedy the situation or problem; (5) predetermining methods, timing, and priorities for achieving objectives; (6) evaluating the success of predeterminate methods in achieving objectives and modifying the plan to meet changing conditions. In requiring this systematic approach, planning for solid waste management is similar to planning for any activity at all levels of Government - State, regional, and local.

Although a plan can and should be revised, while underway, to accommodate changing situations, it should be formalized for continuing reference. A local and regional plan is intended to provide for direct operations of a solid waste management system or to provide the basis for design of solid waste facilities. A State solid waste plan, conversely, is intended to provide the broad framework of policies, regulations, standards, and criteria by which local and regional planning can be accomplished.

A solid waste management plan, therefore, should be a written document and, at the local or regional level, should outline the activities that the agency intends to undertake during the lifespan of the plan. Moreover, it should be both a technical and a policy statement containing objectives for resolving solid waste management problems coupled with a set of directions for achieving these objectives. The statement should then be framed within a time context and an order of priorities. Further, short-term alternatives should be followed through while the planning proceeds. This will afford early impact in ameliorating certain problems, lend credibility to the planning, and engender support for long-term proposals.

APPLICATION

The local or regional plan for solid waste management should adequately serve five functions. It should: (1) provide an internal technical and policy guideline for carrying out the purposes of the local or regional solid waste management agency; (2) provide a public-directed framework of standards for local and regional solid waste management planning and implementation; (3) provide for an integrated management system of approved storage, collection, and transportation, possible resource recovery, and final disposition of solid waste through either direct operations, regulated performance, or a combination of both; (4) establish methods and procedures for translating the plan into system design and direct operations; (5) serve as a legislative support document for advancing improved management of solid wastes within the jurisdiction.

COORDINATION

The essence of planning is coordination. Planning requires resolution of conflicting interests, allocation of available funds and other resources, intergovernmental and interdepartmental cooperation, and establishment of priorities. From the standpoint of the direction and overall needs of local or regional government, a solid waste management plan is one among several functional plans, such as those dealing with streets, sewerage and water, education, health, public safety, and recreation. Local and regional solid waste management plans, therefore, should relate to, and not conflict with, other plans of the jurisdiction. State regulations and required performance standards and other provisions also must be considered. And coordination with the private sector, which provides much of the solid waste services in many areas, is important. The public must be assured of a high level of total service from the private operator at a reasonable cost.

BASIC PLANNING MODEL

The procedure for developing a local or regional plan for solid waste management can be explained by structuring the various steps normally taken in formulating any plan. Figure 11 depicts a simple 8-step model. The planning process is not, as it may appear in the diagram, static but is dynamic and continuous. Also, various steps in the planning process may occur simultaneously, although, in preparing the written plan report, some jurisdictions may prefer to consider each phase in sequence. Each step could, in fact, serve as a separate chapter or section of a plan report.

A planning model should provide for feedback from various planning process events as they occur (Figure 11). This model has built-in controls to accommodate correcting errors discovered through feedback relationships. Developments outside the planning process also can effect corrections or revisions. Social, legal, and environmental changes, for example, should be considered.

Initial Planning

Recognizing that a bad situation or problem exists is the first step in the planning process and the catalyst for the second action—the data collection and analysis to provide the basic facts essential to planning. Analysis of data also will point up problem areas and circumstances requiring consideration in the plan (Figure 11, steps 1 and 2).

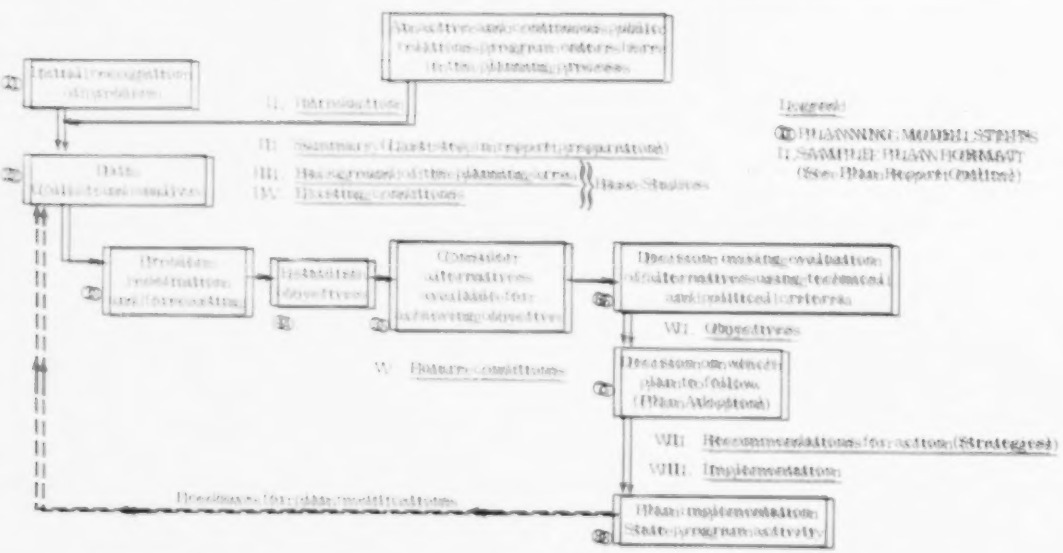
Redefining the Problem

As dictated by data analysis, the next step is to redefine the problem and identify those problems and conditions that will be relevant in the future. This requires forecasting (Figure 11, step 3).

Objectives and Consideration of Alternatives

Enough is now known about the problem to delineate specific objectives and suggest alternative methods for achieving these objectives (Figure 11, steps 3 and 4). The local or regional solid waste management agency is saying rhetorically:

- "What situation should be changed and which problems should be corrected?"
- "Where should modifications be made?"


Objectives and constraints (public relations program considerations in the planning process)
Initial recognition of problem
I. Data collection
II. Summary (Basis for report preparation)
Data collection and analysis
III. Background of the planning area
IV. Existing conditions
Base Studies
Problem redefinition and forecasting
Establish objectives
Consider alternatives available for achieving objectives
Decision making: evaluation of alternatives using technical and political criteria
V. Objectives
VI. Future conditions
Decision on which plan to follow (Plan Adoption)
VII. Recommendations for action (Strategies)
VIII. Implementation
Procedures for plan modifications
Plan implementation (State program activity)
Legend
① PLANNING MODEL STEPS
II. SAMPLE PLAN FORMAT
(See Plan Report Outline)

Step 1 in the planning process is to recognize that a problem exists and needs to be solved. Step 2 is to collect and analyze data relating to the problem. Such analysis permits a redefinition of the problem and a forecast of future situations (3). Problem redefinition for both current and future situations helps to suggest objectives (4). Then, alternatives would be sought to solve the problems. Several alternatives (5) may be available for accomplishing objectives. The most feasible are selected by considering technical, political, social, and other factors (6). Once this decision is made, a plan for solution of the problems (7) can be adopted. Actual action for carrying out the plan follows (8). Effectiveness of the plan is measured during its implementation. This data is fed back into the continuing planning process to guide plan modifications if needed.

Figure 11. BASIC PLANNING MODEL (Adapted from: Developing a State Solid Waste Management Plan, R.D. Trattner, Public Health Service Publication No. 2031, Washington, U.S. Government Printing Office, 1970.))

Emerging Alternatives and Decisions

Which alternative or alternatives should the local or regional agency select to accomplish the objectives that it has set forth for solving its solid waste management problems? The answer here will help establish the program priorities.

The agency's decision-making is subject to many influences that must be considered when developing the local or regional solid waste management plan (Figure 1, steps 5 and 6). Such influences may be both constraints and resources and include political, legal, social, and financial factors, and available technology. Basic among these are technical and political influences. Because of the technical nature of the decisions, a specialized interdisciplinary staff—the one which has been developing the plan to this point—should continue to play a role in supplying information and evaluating alternative solutions and in implementing the plan. Evaluating existing State, regional, or local plans is a particularly important part of this step. Solid waste management plans should be compatible with these plans, assuming they take solid waste needs into account. Thus decision-making for the solid waste management plan will be based to some extent upon political exigencies, specialized technical analysis, and existing plans.

Those alternative solutions that appear feasible on the basis of such considerations should be submitted to the appointed and elected public officials and to the public itself for review and possible adoption, but not without adequate preparation. This means a program of education for both officials and the public as a vital and integral part of the entire planning process. The planning agency should have initiated such an information and education program in the early stages of the plan formulation, and the public information program should continue throughout implementation of the entire plan. News releases, films, articles, and speakers, for example, can help promote public awareness and aid in approval of solid waste management plans and programs.

Establishing the Plan

Once the decision-making stage has been completed, decisions should be translated into the recommended strategies and priorities that form the core of the plan (Figure 1, step 7). Although, at this point, a local or regional plan for solid waste management has emerged, the planning process has not been completed. Planning will be continuous and will proceed concurrently with implementation (Figure 1, step 8). Original plans will need reevaluation and modification to accommodate changing situations. Earlier forecasts will require revision. This evaluation and modification will provide new information and this information, along with the results of implementation, will be fed back into the planning process (Figure 1).

PART TWO: BASE STUDIES

As the term implies, base studies form a data basis for succeeding analyses and recommendations. Base studies help construct a logical framework for rational planning, identify problems and limitations, and inventory available resources.

In planning for local and regional solid waste management systems essential basic information to be assembled and analyzed usually will include data about population; economics; land use; governmental jurisdiction and structure; physical conditions; legal framework; public facilities and services which compete with or complement solid waste management; transportation corridors and modes available; current solid waste practices; and solid waste collection and generation rates.

Much of this data is available from secondary sources. Awareness of these sources eliminates the need for a primary survey and conserves time in collecting and analyzing. About one-fifth of the needed data can be derived from the Office of Solid Waste Management Programs' National survey of community solid waste practices. Additional data are available from State solid waste agencies, from other State agencies, such as departments of planning, natural resources, and highways, and on the local level from city, county, and regional planning departments. Indeed, solid waste planning often will either be conducted by these agencies or closely coordinated with them. Other sources of information are banks, chambers of commerce, and the U.S. Bureau of the Census for facts about population and the economy.

Undoubtedly some primary data collection will be necessary. Data about solid waste generation loads and accurate breakdowns of solid waste components, for example, generally are not available. Here a survey sample must be taken to derive, through weighing and separating the wastes suitable planning figures. In addition, collection practices and equipment, transfer stations, land disposal sites, and incinerators must be examined.

Often accurate financial base data for planning also is lacking. Establishing useful figures for operational or capital costs will require a careful analysis of aggregate data to derive those figures pertaining only to solid waste management. Fairly accurate estimates can sometimes be established by tracing a path through the systems and costing out critical components. Departments of public works or sanitation can be extremely helpful in this regard since these agencies are usually the solid waste management operating agency.

Land use-solid waste generation can be refined further to permit more precise planning where needed. Residential land use, for example, might be subdivided into single and multifamily dwellings. Commercial land uses could be further defined into retail categories, such as drug, food, hardware, and general merchandise outlets. Solid waste generation might then be related to sales volume and selling floor square footage of the store and provide a predictor for commercial land uses in other areas, with similar characteristics. Industrial land uses might be further classified according to the Standard Industrial Code (SIC) categories, such as meat packing, electrical housewares, and motor vehicle production, and facilitate a determination of characteristics of wastes from plants bearing certain SIC designations. Amounts of solid waste could be predicted from a calculation of a plant's product units.

Precise locations (generation nodes) and amounts of solid waste (generation) can then be readily used as variables in a linear program allocation model for optimal assignment to transfer stations, disposal and reduction facilities, and resource recovery yards. This allocation procedure is explained in Part Four (Management Techniques). Depending upon the size area being planned and complexity of the data, this procedure can be adapted to either computer or manual methods. In large, highly complex areas, computer methods for data handling, optimal routing and allocation, and map plotting might be necessary.

Forms 1 through 3 present a format for data array and computation for the three major land use categories, along with suggested breakdowns for more precise planning. Subcategories selected should be appropriate to each major subplanning area.

Transportation and final disposition of solid waste will depend upon generation locations, types of solid waste, and availability of sites for transfer stations,

resource recovery yards, sanitary landfills, and incinerators. All these considerations must be included in planning the total system, and the sites particularly should fit into the area's comprehensive plan. Indeed, sites for solid waste management should become an integral part of the comprehensive plan.

FORM 1: URBAN SOLID WASTE GENERATION: RESIDENTIAL LAND USE CATEGORY

MAJOR PLANNING AREA _____

Sheet ____ of ____ SUBPLANNING AREA _____

Subcategory	Acreage	Population	Waste characteristics* (% each)	Reclamation components (% each)	Waste generation (total)	
					Density	Amount
Single family						
Two family						
Multifamily						
1 floor						
2 floor						
3 to 6 floor						
Over 6 floor						
Institutional						
Hospital						
School						
Religious						
Correctional						
Total						

*Waste characteristics: Ash, metal, paper, combustible, putrescible, plastic, chemical, corrosive, hazardous, infectious, liquid.

FORM 2: URBAN SOLID WASTE GENERATION: COMMERCIAL LAND USE CATEGORY

MAJOR PLANNING AREA _____

Sheet ____ of ____ SUBPLANNING AREA _____

Subcategory*	Selling Floor Area (sq ft)	Sales ($000)	Waste characteristics* (% each)	Reclamation components (% each)	Waste generation (total)	
					Density	Amount
Lumber, hardware, farm equipment						
General merchandise						
Food						
Automotive						
Gasoline service stations						
Furniture & home furnishings						
Apparel accessories						
Eating & drinking places						
Drug stores						
Other retail						
Offices						
Total						

*Waste characteristics: Ash, metal, paper, combustible, putrescible, plastic, chemical, corrosive, hazardous, infectious, liquid.

*Use Use Codes and Business Classifications for subcategories where possible.

FORM 33: URBAN SOLID WASTE GENERATION: INDUSTRIAL LAND USE CATEGORY

Sheet ___ of ___ MAJOR PLANNING AREA ___

SUBPLANNING AREA ___

SIC* Category	Units of production	Waste characteristics** (% each)	Reduction components (% each)	Waste generation (tons)	
				Daily	Annual
2011 Meat packing					
2037 Frozen fruits, juices and vegetables					
2522 Metal office furniture					
2621 Paper mills					
2653 Corrugated and solid fiber boxes					
2818 Organic chemicals					
3079 Plastic products					
3324 Pharmacy administration					
3324 Electrical hardware and tools					
3451 Bolts and rivets screw machine products					
3711 Motor vehicles and parts					
3721 Aircraft					
Total					

*SIC = Standard Industrial Classification

**Waste characteristics: AA = metal; BB = paper; CC = wood; DD = plastics; EE = food; FF = chemical; GG = petroleum; HH = solid waste; II = packaging; JJ = glass.

POPULATION

Past, current, and future population of a jurisdiction, along with family size, age distribution, densities (by other planning area, enumeration district, or census tract), and growth rates is an important planning consideration. When related to solid waste generation rates, land uses, employment centers, and other data, population information can help determine sources of solid wastes, equipment needs, capacities, and locations of reduction and disposal facilities.

LAND USE

Land use considerations are the nucleus of local and regional comprehensive plans and a prerequisite for community plans concerned with transportation, housing, and the full range of public facilities and services. Local and regional land use planning focuses on better arrangements and uses of land in accordance with economy, public interest, convenience, health and safety, and amenity. It is especially critical to solid waste management, where land is needed for transfer, disposal, reduction, and resource recovery facilities.

Usually these land needs must compete with other land needs. More important, however, public acceptance must be gained since reservation or acquisition of land for solid waste purposes often engenders public opposition manifested in angry protests at public hearings, in unfavorable newspaper coverage, in political pressures, and even in formalized local ordinance. Solid waste land uses, for example, are often left out as a permitted use in zoning ordinances or else specifically prohibited. Land that *is* made available often is unsuitable because of soil, geology, topography, water pollution potential, inadequate protection to natural resources, or because it is so isolated from the service area that it is uneconomical.

Effective land use planning for solid waste management must weigh air, water and land pollution potential, transportation economics, location, population relationship to overall community plans, and the ultimate use of the land. In considering these elements for land use planning, solid waste must be viewed in three basic stages—generation point, transportation, and final disposition.

For urban generation, solid waste should be identified according to residential, commercial, and industrial land

uses. If the community has a comprehensive planning program, a land use survey usually has been completed and data have been recorded and mapped. This land use inventory should serve as the basis for relating solid waste generation to specific land uses. For example, a part of the existing land use will probably be residential. Individuals in these residences generate a certain amount of solid waste. By dividing the total residential acreage into the total solid waste generated by residents living on that acreage, for a given time period, the generation rate can be derived. Assuming a generation rate that includes an growth factor and examining projected figures and plans for land use, a fairly realistic estimate of expected solid waste generation can be developed for existing and future residential areas. This approach has the advantage of yielding total figures for solid waste generation, as well as the location or nodes of generation. Zoning is also an indicator of the potential solid waste load on the system and a means of estimating spatial distribution.

Local and State planning agencies, economic development agencies, and chambers of commerce can provide much data already tabulated and analyzed on population. If the data are not available from these sources, U.S. Census publications contain considerable population data; these, however, will require organization and analysis.

ECONOMICS

Knowledge of the economy of a jurisdiction will provide valuable insights into the existing and future generators of solid waste, the competition for public funds, and the capability of the jurisdiction to provide increasing revenues as demands for expenditures grow. Relevant factors include: industrial composition, employment groups, family income, retail trade, trade area, number of retail establishments, import-export (local and regional), tax base (assessed valuation), tax rates, and debt limitations and capacities. The potential for materials recovery and their marketability also should be examined.

Much of this data will be available from local and State planning agencies, economic development agencies, chambers of commerce, banks, universities, and the U.S. Bureau of the Census in report form complete with analysis. In some cases, additional economic data must be collected and analyzed; or, often other raw data is available from the agencies mentioned.

GOVERNMENT STRUCTURE

To determine the adequacy of jurisdictional organization structures for solid waste management, or to propose more effective alternatives in the plan, the existing governmental structure should be clearly understood. A regional planning area may involve several individual jurisdictions, making the problem more complex. Especially relevant will be the names, official boundaries, powers and responsibilities of these jurisdictions, and any functional relationships to solid waste management. During the development of the plan, close coordination must be maintained with all governmental units in the planning area.

LAWS AND ORDINANCES

Since plans for solid waste management will both affect and be affected by State laws and local ordinances, a cognizance of existing laws and ordinances and an inventory of all laws and ordinances pertinent to solid waste management is necessary basic data. Particularly relevant are those dealing with public health, zoning, subdivision regulation, building codes, public finance, intergovernmental agreements, air and water pollution, planning, and, of course, those dealing specifically with solid waste. Such an inventory will provide both the legal framework for planning and the basis for new laws and ordinances or for amendments where existing laws are inadequate.

PUBLIC FACILITIES AND SERVICES

Often solid waste management will compete for funds and other resources with various public facilities and services in the area. Frequently, in fact, solid waste management is a function carried on by these activities, particularly in the case of public works and street departments. In other cases, these facilities and services can complement solid waste management. Existing utilities, for example, might be restructured to include solid waste management, or central garages and yards might be used for transfer station sites or resource recovery stations.

During the basic studies, survey information should be developed to interrelate solid waste management and the following public facilities and services:

- Government centers
- Public works
- Water and sewerage
- Service utilities
- Health facilities
- Schools
- Central garages and yards
- Shipping terminals

PHYSICAL CONDITIONS (MAN-MADE AND NATURAL)

Locational analysis of actual or potential solid waste reduction and disposal sites should consider physical and natural conditions, to assess suitability for solid waste management and to provide adequate environmental protection. Data should include: topographic features; general soils; groundwater; flood areas; oil, gas, and coal resources; clay, shale, and rock deposits; timber; and climatology. These data may already be available from either local, regional, or State planning agencies or from the U.S. Geological Survey, the U.S. Department of Agriculture, the National Weather Service (NOAA), universities, State geological survey, and State natural resources departments.

TRANSPORTATION

Transportation is vital to a solid waste management plan; solid waste must be moved for disposal or for resource recovery. A street or highway is the single most important and common mode. Others, such as rail and barge routes, are potentially significant, however.

An inventory of transportation facilities should evaluate these facilities in terms of present and future application to collection routing, and hauls to transfer stations, disposal and reduction facilities, and resource recovery stations. Transportation facilities contained in local or regional comprehensive plans should be related to future solid waste management needs. Examples of transportation information which should be collected and analyzed are:

Streets	Highways
Primary	Freeway and expressway
Collector	Primary
Local	Collector
Railroads	**Bargeways**
Longline	Canals
Shortline	Rivers
Yards	Locks
Terminals	
Trucks	
Rails	
Barge	

Specialized information regarding streets and highways which might be useful in some instances includes:

- Travelway width
- Number of traffic lanes
- Surface type
- Section length
- Present average daily traffic (ADT)
- Future ADT
- Peak hour percent of ADT
- Operating speed
- Load limits (Some vary with season)

CURRENT SOLID WASTE PRACTICES

Collection and analysis of data about current solid waste practices will require care and diligence. Accurate and sufficient solid waste data generally is unavailable. Yet a solid waste plan cannot be developed without it. About one-fifth of the required data can be derived from the Office of Solid Waste Management Programs' National survey of community solid waste practices. The remaining specific solid waste data will require surveys, although carefully taken samples often will suffice.

Generally, current data needed in addition to that described earlier will be concerned with the specifics of storage, collection, transportation, transfer, disposal, reduction, resource recovery, and various organizational management aspects. Examples of planning considerations and the kinds of data required follow:

Existing methods
- Storage
- Collection (type, frequency, quality)
- Transportation (including transfer)
- Disposal and/or reduction
- Resource recovery and recycling

Waste generation (See land use base studies for related data)
- Location (tons generated and collected)
  - Political subdivisions
  - Major planning area
  - Subplanning area
- Amounts (tons generated and collected)
  - Residential
  - Commercial
  - Industrial
  - Other
- Types (Classify by components)
  - Residential
  - Commercial
  - Industrial
  - Other

Equipment and property
- Trucks (types, capacities, life)
- Transfer stations (locations, types, capacities, life)
- Land disposal (locations, types, capacities, life)
- Incinerators (locations, types, capacities, life)
- Resource recovery stations (locations, capacities, equipment, life)

Management problems (See also Part Three, Management Considerations)
- Overall evaluation
- Environmental effects (air, water, population densities, noise)
- Finance (capital, operating, fees, records)
- Organization
- Manpower
- Industrial relations
- Private/public systems (areas of responsibility)
- Contractual arrangements
- Regulation/enforcement
- Public relations

A complete analysis of the current and future effects of these data should be made.

A jurisdiction planning profile (Form 44) will aid in organizing the basic problem-objective-action procedure for solid waste planning at the local or regional level. Although the form does not take into account all planning considerations, by using it the findings in the base study evaluations will be more clearly focused and related to action solutions.

FORM 44. JURISDICTIONAL PROFILE
FOR SOLID WASTE PLANNING/MANAGEMENT

Planning jurisdiction _____

Name of community (ies) affected _____

Region of State _____

Relevant community data*

Significant problems

Type

Location

Extent and permanence

Contributing factors

Effects/significance of problems

Objectives for action

Specific recommendations for action

Positive and negative

Timing and priorities

Location

Responsibility

Estimated costs/operating and capital

Problems to be solved

*Derived from specific data generated for the community/from the National Survey of Community Solid Wastes Practices.

BIBLIOGRAPHY

American Public Works Association. Municipal refuse disposal. 3rd ed. (Chicago). Public Administration Service. 1970. 553&8pp.

American Public Works Association. Refuse collection practice. 3rd ed. (Chicago). Public Administration Service. 1966. 552pp.

Black, R.J., and A.M. Barness. Effect of earth cover on fly emergence from sanitary landfills. *Public Works*, 89(2):91-94. Feb. 1958.

Boyd, G.B. and M.B. Hawkins. Methods of predicting solid waste characteristics. Washington, U.S. Government Printing Office. 1971. 28pp.

Clapp, H. Urban land use planning. 2nd ed. Urbana, Ill., University of Illinois Press. 1965. 498pp.

Clark, R.M., and R.G. Tolliver. Land use planning and solid waste management. *Public Works*, 103(3):79-80, 98. Mar. 1972.

Cummins, R.L. Effects of land disposal of solid wastes on water quality. [Cincinnati]. U.S. Department of Health, Education and Welfare. 1968. 29pp.

Darnay, A. Recycling assessment & prospects for success. Washington, U.S. Government Printing Office. 1972. 144pp.

Davis, P.C., and R.J. Black. Effects of garbage grinding on sewage systems and environmental sanitation. *APWA Reporter*. 29(12):16-18. Dec. 1962.

Heikman, H.L., Jr. Characteristics of municipal solid wastes. *Scrap Age*. 26(2):30-35-37. Feb. 1969.

Heikman, H.L., Jr. Planning comprehensive solid waste management systems. *Journal of the Sanitary Engineering Division*, Proc. ASCE, 94(SA6):1147-1152. Dec. 1968.

International City Managers' Association. Principles and practice of urban planning. (Chicago). 1968. 622pp.

Investigation of planned refuse collection and disposal. *Journal of the Sanitary Engineering Division*, Proc. ASCE, 82(SA3):1044-1 – 1044-33. June 1956.

Mulrich, A.J., A.J. Klee, and C.R. Hampel. 1968 National survey of community solid waste practices. Public Health Service Publication No. 1866. Washington, U.S. Government Printing Office. 1968. 583pp.

Mulrich, A.J., A.J. Klee, and P.W. Britton. Preliminary data analysis: 1968 national survey of community solid waste practices. Public Health Service Publication No. 1867. Washington, U.S. Government Printing Office. 1968. 483pp.

Planned refuse disposal; a report to the Directors of County Sanitation Districts of Los Angeles County, California. Joint Administrative Staff. Los Angeles County Sanitation Districts. Sept. 1955. 117pp.

Tolliver, R.G. Developing a state solid waste management plan. Public Health Service Publication No. 2033. Washington, U.S. Government Printing Office. 1970. 50pp.

Vaughan, R.D. Reuse of solid wastes: a major solution to a major national problem. *Waste Age*. 1(1):10, 14-15. Apr. 1970.

Vaughan, R.D. Solid wastes and air pollution. [Cincinnati]. U.S. Department of Health, Education, and Welfare. 1969. 116pp.

PART THREE: MANAGEMENT CONSIDERATIONS

A solid waste management plan would be incomplete and largely inadequate without provisions for operational activities, such as administration, organization, finance and budgeting, manpower, industrial relations, public relations and public input, equipment and facilities management, and control and evaluation.

Inadequate organization has been at the root of poor solid waste management. A viable and adequate organization, therefore, cannot be overemphasized in planning an effective, efficient system. The relationship of both the public and private sectors in solid waste management also requires special consideration since each has important responsibilities.

Manpower, another significant part of solid waste management systems, must be considered carefully and should include long-term staffing forecasts, recruitment methods, training elements and procedures, occupational health and safety standards, collective bargaining, and grievance and arbitration arrangements. All position classifications should be considered--including equipment operators, clerks, administrators, and professional personnel--to properly plan for short- and long-term needs. Manpower planning will also help point routes of promotion, provide for continuity in the system, and indicate training program needs.

Physical resources should not be ignored. Equipment and facilities needs, purchases, operating and capital costs, maintenance and salvage procedures must be planned and developed within the system.

Public acceptance of the needs and services of the system is critical to its success. An active public relations program must be a continuing part of the system's activities. In addition, an advisory committee can afford important support and direction for the system.

Operating and capital budgets must be prepared to guide expenditures for the system for current and future periods, and sources of revenue to support expenditures must be identified. Regardless of the method or combination of methods used, efforts should be made to relate the actual cost of the integrated management system to adequate charges for services provided. Finally, to control the system effectively, accounting procedures, with adequate records, should be installed to measure not only financial aspects but also services performed, safety performance, employee performance, employee development and retention, and public attitudes toward the service.

If private contractors are franchised or licensed to provide the services for the operating jurisdiction, many of the foregoing considerations will be their management responsibility. Nevertheless, the responsible public agency must insure that its contractors perform these responsibilities efficiently and effectively to provide a high level of uninterrupted service at a reasonable cost.

ORGANIZATION

The day-to-day implementation of technology and public service objectives requires an efficient and effective basic organization. Six points are crucial in developing an organization for solid waste management: (1) it should be designed to achieve planned objectives; (2) it should have commensurate authority and responsibility; (3) it should fit, both legally and logically, into the overall jurisdiction of which it is a part; (4) it must have adequate qualified personnel; (5) it must have adequate capital and operating finances; (6) it should propound an integrated system for storage, collection, transportation, disposal, and possibly resource recovery and reuse of solid waste materials.

Appraisal

Both existing and other alternative organizational forms should be examined to determine their adequacy for solid waste management--their advantages and disadvantages, financing, establishment requirements, possible service effects, for example. The objectives desired for the solid waste management system should then be compared with this appraisal to derive design requirements for the system's organization.

Background information needed for this appraisal should be developed in the base studies (Part Two, Governmental Structures).

Design Consideration

Areawide or regional approaches will be important organizational possibilities for the overall jurisdiction. Operating forms, such as utilities, authorities, joint

agreements, contractual arrangements, and agreements, should be considered within the regional context. The concept of *maximum operational authority*—which essentially states that, wherever possible, a solid waste management system be installed throughout an entire region and operated universally on an integrated management basis—should be observed. Everyone would receive solid waste service. In a rural region of three counties, for example, maximum operational authority would mean that no person, business, city, or any entity lacks an approved standard of collection and disposal service. Charges for the service would apply universally and accurately reflect the total cost of the service, but would allow for varying charges for different levels of service. In an urban region, the maximum operational authority would encompass the entire metropolitan area.

Intergovernmental Mechanisms

To solve solid waste problems by planning and implementing management systems within regional configurations requires appropriate legal organizational mechanisms that are oriented toward intergovernmental cooperation and that serve to unify the numerous, and often conflicting, individual jurisdictions. In addition, the regional configuration selected should be conducive to a solid waste management system that is established on an integrated management basis with maximum operational authority. The operating region should be delineated to maximize the population that is served. Incompatibility often may require a separate, but adjoining, operating region. A county or group of counties will often provide a convenient organizational framework for a solid waste management system.

Important to policymakers and planners of intergovernmental organizations for solid waste management are the joint approach mechanisms available, including administrative arrangements, financing, management reporting, and areas of mutual responsibility. The main intergovernmental mechanisms are: ((1)) joint operation of a service facility by two or more units; ((2)) provision of a service on a contractual basis by one governmental unit to at least one other governmental unit; ((3)) an overall operating district, authority,, or utility supervised by a board of commissioners or directors with day-to-day operation delegated to a manager and staff. All three can be modified. Under each, the agency or operating authority responsible for facilities or services may use its own staff and facilities, those of the units receiving the service, or those of private suppliers or contractors.

Joint Operations. In all States, local units of government may agree under certain circumstances to perform various public services jointly. Generally, agreements can be used to undertake any functions and responsibilities that each unit could undertake singly. Typical services might include police and fire protection, sanitation, public health, joint operation and occupancy of public buildings, mass transportation, and water supply. The joint efforts can involve an exercise of powers or an agreement or contract for services. In application to solid waste management, interest centers on the contract or agreement among units of government for the joint provision of a service.

The financing techniques used by a local government acting alone usually can be converted for joint operations. User charges might be levied to cover direct operations and to retire revenue bonds. Or funds might be provided from general revenues derived from tax levies imposed by each participating governmental unit or from special taxing powers of the solid waste management jurisdiction. Exact methods would depend upon State statutes or the preferences of the participants to the joint agreement.

Contractual Service. Municipal services provided under contract include those supplied by one governmental unit to other units, by private operators, or by a combination. Many States have enacted legislation that enables their local units of government to enter into such agreements. Among their many advantages is the elimination of duplicate services, staffs, and expenditures. Operations and budgets also are more easily planned. If private contractors are used, the governmental unit does not have to hire and maintain its own employees. Furthermore, a contract with a private operator will fix costs for a definite period and thus provide a more positive planning base. To insure high-level uninterrupted service, however, the contract should be carefully drafted. In addition, to allow for capital commitment for trucks, sites, and other acquisitions and to provide a stable workforce, a contract should be written for no less than 5 years.

Overall Operational Organizations. In a regional solid waste management approach, intergovernmental agreements might be further formalized by establishing organizational entities that permit operations, possible taxing or user fee assessment power, and incurring debt through various bond mechanisms. The operational organizations relevant to intergovernmental management of solid waste—authorities, special districts, and utilities—are usually established according to specifications contained in each State's statutes. Intergovernmental agreements or organizations at the local level which cross State boundaries must be

authorized by statute in each State affected—sometimes by an constitutional provision. Congressional consent usually is not required for a local interstate organization, even though any type of interstate compact is involved.

Although there are advantages in a specific organization with special powers such as special districts and authorities, this approach requires caution and should be undertaken only after alternatives, such as an intergovernmental or contractual agreement, have been rejected. It has been far too easy to add layers of local jurisdiction each time a new problem arises. A satisfactory alternative, which combines certain advantages of several approaches, would be to organize, through an intergovernmental agreement, a regionwide authority that operates as a utility with maximum operational authority for an integrated solid waste management system.

The authority-utility would be empowered to license and regulate private contractors; to regulate local government operations; or to undertake its own collection, transportation, disposal, reduction, and resource recovery operations and to establish and enforce all standards for a specific region. Financing its own facilities or leasing them to private contractors could be equitably done with funds derived from user charges and revenue bonds. Day-to-day management would be the responsibility of an manager answering to a board of directors.

A second example involves a division of authority and responsibility among different governmental levels along functional lines. For instance, operating under broad State regulation, a regional agency would provide for the capital investment and operation of transfer stations, sanitary landfills, incinerators, resource recovery stations, and other large facilities. Local jurisdictions would conduct collection services and other strictly local functions. Such an approach also would require intergovernmental agreements governing operations, financial arrangements, and designation of responsibilities.

FINANCIAL PLANNING

Financing planning identifies and describes methods for securing funds for acquiring and operating facilities and equipment called for in an plan. Funds usually are derived from a mixture of several sources, including long- and short-term debt, revenues generated from operations, tax levies, and sale of surplus assets. These sources must be identified during planning. Several questions are pertinent during planning to help provide the basis for budgeting. Can capital funds be obtained through general obligation or revenue bonds? What are our debt capacities? Will general tax levies be applied over the service area, or can revenue be generated by direct service charges? Is pay-as-you-go financing possible?

The budget is as plan showing how resources will be acquired and used over as specified time. It is as fundamental planning tool and one of the most effective techniques used in government and business to accomplish the objectives of management. A solid waste management plan, therefore, should include both as capital budget, which describes investments in capital equipment and facilities, estimates of cost, and time of acquisition over the life span of the plan, and an operating budget, which shows estimated operating costs for the first 1 or 2 years of the plan.

MANPOWER PLANNING

As in any operation requiring large numbers of personnel, a manager of a solid waste management system will find manpower needs and management of personnel one of his largest concerns. To reduce uncertainties about future manpower needs and to provide continuity in the solid waste management system, a manpower plan should be incorporated into the local or regional solid waste management plan. It should present a comprehensive listing of all position classifications in the system, the existing personnel in each classification, the estimated personnel required 5 or 10 years hence, and the projected estimated personnel costs. Retirements and other attrition should be anticipated by determining ages of employees and by considering normal turnover rates. Reasonable estimates of *in* and *out* transfers should be included in these computations. Planning will provide for adequate numbers and kinds of personnel as well as chart the paths of promotion of personnel to insure continuity of the organization.

Planning for manpower should also include training needs and programs to prepare employees initially and to maintain their knowledge and skills during employment. Changing requirements for certain skills should be anticipated in the plan and become part of a retraining program. As emphasis shifts from disposal to recycling, inspectors, for example, might need training in the distribution and economics of secondary materials.

Forms 5 and 6 will aid in organizing and computing manpower information.

FIGURE 55: MANPOWER PLANNING IN A SOLID WASTE MANAGEMENT ORGANIZATION

Classification	Age groups									Total all ages
	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	
Management										
Administrative										
Engineers										
Scientists										
Other professionals										
Technicians										
Engineering officials										
Licensing officials										
Heavy equipment operators										
Sanitary landfill operators										
Incinerator operators										
Transfer station operators										
Recirculation station operators										
Public truck operators										
Other collection personnel										
Street cleaning personnel										
Total										
Present										
55 years										
100 years										

FIGURE 66: SOLID WASTE MANAGEMENT ORGANIZATION: MANPOWER LOSSES*

(55- and 100-Year Estimates)

Classifications	Total all ages (present)	Scheduled retirements	Transfers (out)	Other losses+	Total losses	Estimated available manpower		Manpower requirements	
						(55 yr)	(100 yr)	(55 yr)	(100 yr)
Management									
Administrative									
Engineers									
Scientists									
Other professionals									
Technicians									
Engineering officials									
Licensing officials									
Heavy equipment operators									
Sanitary landfill operators									
Incinerator Operators									
Transfer station operators									
Recirculation station operators									
Public truck operators									
Other collection personnel									
Street cleaning personnel									
						Estimated total personnel costs		55 years $$	
								100 years $$	

*From current manpower

+Including voluntary and forced terminations, disabilities, deaths, and military reservists

INDUSTRIAL RELATIONS

An immediate challenge in many solid waste management systems will be the insistence of employees to assert employee rights through work stoppages. Mechanisms should be adopted to help minimize such stoppages and to permit continued service to the public.

Methods employed successfully for many years in the private sector include: ((1)) acceptance and legal designation of a bargaining agent and unit; ((2)) negotiation of a collective agreement or contract; and ((3)) grievance and arbitration procedures. Grievance procedures should be designed to resolve issues early to avoid entering into arbitration. Indeed, a fair hearing of all grievances and demands in exchange for the public employee's agreement not to strike is a public responsibility. Strikes, nevertheless, are always a possibility even if grievances are equitably heard by the public employer. Arbitration should then be used in public labor relations, whenever possible, to avoid work stoppages. Voluntary arbitration is preferable; failing this, however, compulsory arbitration should be used, particularly in emergency situations where work stoppages threaten to impair public health or welfare.

Although illegal in most public employment places, strikes have been occurring with increasing frequency in recent years. Thus a strike plan should be prepared to carry on essential services if negotiations break down. Such a plan should take into account ((1)) legal steps, including the security of public property; ((2)) information techniques that could be readily implemented to communicate with both the public and the strikers; and ((3)) procedures outlining initial steps to take once the strike ends.

In contract negotiation, experienced union negotiators with full power to make contract commitments usually will represent the public employees. Often this same power, or rather the lack of it, to commit the public to contractual decisions hampers the public's bargainers. The solid waste management plan, therefore, should include procedures for vesting authority for contract commitments in a responsible group composed of both public legislators and executives. The public jurisdiction's collective bargaining team, for example, should include representatives from the jurisdiction's legislative body, such as the city council or county commissioners; the chief executive's office (but not the chief executive himself); personnel and legal departments; and the department in which the bargaining unit is employed. This team should be aware of and give special attention to presenting the jurisdiction's objectives in the contract, determining key policies on management rights (public interest), work rules, job security, and relationships to civil service or merit system provisions.

PUBLIC EDUCATION

An active educational campaign during both planning and implementation can create greater public understanding of the need for proper solid waste management. The public can be alerted to what is considered the highest quality of solid waste management and what it can do to achieve this quality. Several techniques and methods are available: ((1)) scheduling talks to lectures to service clubs, schools, League of Women Voters, community action groups, government officials and others; ((2)) disseminating information through newspapers, radio, and TV media; ((3)) assembling and disseminating available information on local solid waste practices and environmental conditions; and ((4)) developing and preparing special information materials like pamphlets, booklets, films, and monographs.

ADVISORY COMMITTEES

Advisory committees can guide and support solid waste management planning and implementation at the State, local, or regional levels. The specific purposes of the advisory committee should be determined first and criteria should then be established for selecting its members. An advisory committee might be formed, for example, to provide only technical advice to the solid waste management planning agency, and, in this case, advisory committee members must reflect technical expertise in various aspects of solid waste management. An advisory committee with broader responsibilities, however, might serve to: ((1)) provide technical insight; ((2)) assure adequate coordination with other public agencies, such as those concerned with air, water, local government, and State and regional planning; ((3)) provide an interface between solid waste planning and operations if these activities are part of different agencies; and ((4)) offer policy direction.

If possible, advisory committee functions should be limited to recommendations and resolutions of approval. Disagreements should be resolved or modified during sessions of the committee. Final decisions ideally should reside with the responsible solid waste management agency.

PROPERTY AND EQUIPMENT MANAGEMENT

The plan should incorporate specific provisions ((1)) for acquiring equipment and other capital property on a scheduled basis with full consideration of capital and operating cost and source of revenues; and ((2)) for

maintaining, protecting, retiring, and finally disposing of all property. Form 77 suggests a capital property acquisition schedule.

Physical protection of property against carelessness and theft is important. Inventories of spare parts and salvable reclaimed materials should be well controlled through recordkeeping of incoming and outgoing items. Adequately insuring properties and bonding employees directly handling these properties, although not preventing loss, provide for recovery after a loss is incurred. Another, less obvious, property loss is the consequence of little or no maintenance, which can result in higher than planned operating costs, interrupted solid waste services, and earlier than planned replacement.

CONTROL AND EVALUATION

An important function of management is evaluation. Too frequently, solid waste management performance is *not* critically evaluated. Consequently, service often deteriorates, inefficiency abounds, and costs increase faster than necessary. But, what parts of solid waste management need evaluation to possibly improve performance?

Although solid waste management systems may differ, there are some common factors which should be appraised. Costs of manpower, equipment, supplies, and facilities, as examples, are critical to the effective and efficient operation of any system and must be identified so that the manager can evaluate and control them. Further, critical costs should be broken out into manageable units, because when costs are aggregated it is difficult to pinpoint problem areas.

A useful tool for evaluation of solid waste management performance is the operating ratio. Ratios are expressed as mathematical proportions between major cost or resource expenditures and performance elements in the management system. For example, in considering the entire collection workforce, an important relationship for controlling manpower costs and scheduling route time might be the ratio of one collector man-day to tons of solid waste collected. Suppose, for example, one collector is normally able to collect 4 tons of solid waste in a task day as based on an overall workforce mean average. The ratio value would be 0.255 as shown in the equation:

$$\frac{1 \text{ collector man-day}}{4 \text{ tons solid waste}} = 0.255$$

A norm might be established at the 0.255 figure for the entire collection workforce and related to the total tonnage collected. A variance from this norm would indicate to the manager that a change in operation had occurred; an unfavorable change in operation, for example, could result in higher costs per ton collected. If this variance persists, the manager should determine the exact cause and take corrective action if needed. In using ratios, however, system norms must be established based upon method of operation and levels of service. In all cases, accurate measurements must be made and recorded to make reliable and valid evaluations.

Other ratios could be developed which would help evaluate frequency of accidents or performance of equipment during a working period. Business ratios are useful in solid waste management too. An example is the *current ratio*, the relationship of current assets to current liabilities. This ratio generally depicts the adequacy of the working capital of a company and the company's ability to meet its day-to-day payment obligations.

FORM 77: CAPITAL ACQUISITIONS SCHEDULE

Capital item	Estimated total cost $$	Budget 1980 $$	Budget 1981 $$	Budget 1982 $$	Budget 1983 $$	Budget 1984 $$	Budget 1985 $$	Total 6-year program	Long-range proposals for 1980
SLF site No. 1									
SLF site No. 2									
Incinerator (HRT)									
Transfer station									
Reclamation yard									
Other station									
Scales (3)									
Scale equipment									
Dozers (3)									
Loaders, front (3)									
Compactors (2)									
Tractor loaders (3)									
Water trucks (2)									
Pickup vans (10)									
Truck vans (290)									
Total									
TOTAL 1981 to 1985 Short-range and 1986 to 1990 long-range proposals									

The use of operating ratios in solid waste management, carefully selected and applied, can provide measurements which could make better management easier. A higher level of service at a more equitable cost for the consumer could well result.

BIBLIOGRAPHY

Clark, R.M., and R.O. Toffner. Financing municipal solid waste management systems. *Journal of the Sanitary Engineering Division*, Proc. ASCE, 96(SA4):885-892, Aug. 1970.

Clark, R.M., R.O. Toffner, and T.W. Bendixen. Manage solid wastes as a utility. *American City*, 86(2):48-49, Feb. 1971.

Clark, R.M., R.O. Toffner, and T.W. Bendixen. Management of solid waste—the utility concept. *Journal of the Sanitary Engineering Division*, Proc. ASCE, 97(SA1):33-40, Feb. 1971.

Cooperative landfill—park project combines service of seven jurisdictions. *Western City*, 37(7):47, July 1961.

The International City Managers' Association. Municipal public works administration. Chicago, 1957. 449 pp.

Kennedy, H.W. A new role for the urban county?—the Hallowood plan. *In* Capitol, courthouse, and city hall. Meriam, R.L., *ed.* Boston, Houghton Mifflin Company, 1950. pp. 224-227.

Miller, D.E. The meaningful interpretation of financial statements. New York, American Management Association, 1966. 238 pp.

Minnesota. Sessions laws. An act creating a Metropolitan Council for the counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington; providing for the operation thereof. chap. 896, H.F. No. 1508, 1967. (Codified in Minnesota stat. annotated, chap. 473B, Metropolitan Council [new].)

Minnesota. Sessions laws. An act relating to the Metropolitan Council; providing for the creation of a sewer service board and prescribing its duties and powers; providing for the collection, treatment and disposal of sewage in the metropolitan area. chap. 449, S.F. No. 2397, 1969. (Codified in Minnesota stat. annotated, chap. 473C, Metropolitan Sewer Service [new].)

Minnesota. Sessions laws. An act relating to the Metropolitan Council; providing for county solid waste plans to conform to the Metropolitan Council plan. chap. 8447. (Codified in Minnesota stat. annotated, chap. 473.811.)

Moore, C.J., and R.K. Jaedicke. Managerial accounting. 2d ed. Cincinnati, South Western Publishing Company, 1967. 722 pp.

Sanitary landfill by contract. *American City*, 77(2):103-105, Feb. 1961.

Seven New Jersey communities plan joint landfill venture. *Refuse Removal Journal*, 6(12):28, Dec. 1963.

Toffner, R.O., and R.M. Clark. Intergovernmental approaches to solid waste management. U.S. Environmental Protection Agency. Washington, U.S. Government Printing Office, 1970. 188 pp.

Van Kleeck, L.W. Safety practices at sanitary landfills. *Public Works*, 90(9):111-113, Aug. 1959.

Worden, D. Personnel management and industrial relations. 6th ed. Englewood Cliffs, N.J., Prentice-Hall, Inc. 1970. 784 pp.

Zausner, E.R. An accounting system for incinerator operations. Public Health Service Publication No. 20832. Washington, U.S. Government Printing Office, 1970. 107 pp.

Zausner, E.R. An accounting system for sanitary landfill operations. Public Health Service Publication No. 20807. Washington, U.S. Government Printing Office, 1969. 188 pp.

Zausner, E.R. An accounting system for solid waste collection. Public Health Service Publication No. 20833. Washington, U.S. Government Printing Office, 1970. 244 pp.

Zausner, E.R. An accounting system for transfer operations. Public Health Service Publication No. 20834. Washington, U.S. Government Printing Office, 1970. 210 pp.

Zausner, E.R. An accounting system for solid waste management in small communities. Public Health Service Publication No. 20855. Washington, U.S. Government Printing Office, 1971. 188 pp.

PART FOUR: MANAGEMENT TECHNIQUES

A number of quantitative management techniques are applicable to solid waste planning and management. Statistical methodologies are appropriate for analyzing and forecasting solid waste generation rates, population, economic conditions, and future land uses. Other techniques aid in scheduling, budgeting, and evaluating. The Program Evaluation and Review Technique and Critical Path Method (PERT/CPM) and the methodologies of the Planning-Programming-Budgeting System (PPBS) and operations research, for example, are increasingly used among planners and managers in government and private industry. Further, the continuing requirement for information to support planning process systems has encouraged greater attention to design and development of management information systems (MIS).

The diversity of skills and knowledge required for application of specialized management techniques, and indeed for planning itself, demands a project team approach with interdisciplinary representation. An interdisciplinary solid waste planning team might typically include: an urban or regional planner, a management specialist, an engineer, an economist, an operations research specialist, a lawyer, and an ecologist. The project manager might come from these or other disciplines; primarily, he should be capable of effectively directing the team through creative synthesis of its special skills and knowledge.

PROGRAM EVALUATION AND REVIEW TECHNIQUE AND CRITICAL PATH METHOD (PERT/CPM)

These planning and control techniques best suited to initial development of a plan are accomplished through time-event network analysis. To apply PERT/CPM, three basic questions about the project should be asked: What tasks must be finished before this task can begin? What tasks can be accomplished concurrently? What tasks can begin after another task is partially complete?

Scheduling is flexible with PERT/CPM to the extent that project activities may be either scheduled according to their normal times of completion or speeded along a crash or modified crash plan. Crashing will affect a higher cost for the project, but the lowest increase in cost is selected so that a reasonable trade-off between increased cost and project length results.

PLANNING-PROGRAMMING-BUDGETING SYSTEM (PPBS)

This management tool provides a method for rational decisionmaking in government. A characteristic of PPBS is that it requires output measurement of a given unit of effort (e.g., crimes prevented because of added policemen, incidence of disease reduced because of immunization programs, or reduction of open dumps because of added manpower units for inspection and enforcement, etc.) rather than just input (i.e., money, manpower, and time). The basic elements of PPBS include: (1) consideration of future implications of any programmed effort; (2) identification of a governmental unit's objectives and relevance of all activities, regardless of organizational responsibility, to these objectives; (3) consideration of all pertinent costs (operating and capital); and (4) systematic analysis of alternatives for reaching objectives, including estimated total cost of each alternative as well as correlative major cost and benefit trade-offs.

In jurisdictions installing PPBS, the planning and implementation activities of the solid waste management agency should be designed to relate to this system. The planning procedures presented in this guideline, especially those concerned with setting objectives and measuring results, will permit a plan to be readily adapted to PPBS.

LINEAR PROGRAMMING (LP)

This mathematical technique, useful for finding the best or optimum applications of limited resources, is based on the linear or proportional relationship between two or more variables. Linear programming has several valuable applications in improved solid waste management. For example, it can permit the design of an optimal collection network; determine which combination of several alternative sites for proposed transfer stations would be best; or locate the best disposal, reduction, or reclamation sites. Not only can

the LP technique result in maximum solid waste service to the community at minimum cost, it also may reveal several alternative courses of action not apparent otherwise.

The technique requires adequate data, derived from effective accounting of costs and performance, for the variables used in LP equations to express the LP objectives of maximized system performance with minimized cost.

QUEUING THEORY

This is a method for dealing with waiting lines in a way that results in an optimum lowest cost for both the waiting line and the service facility. If, for example, it could be shown that having packer trucks waiting to unload at a transfer station were more expensive than providing an additional unloading bay, the latter's cost would be justified. Construction of the bay would afford lowered operating cost plus faster collection service since the packer truck could return to its route more quickly. This illustrates the essence of queuing theory applied to solid waste management. Planning a system will reveal several similar opportunities for its use.

MANAGEMENT INFORMATION SYSTEMS (MIS)

Adequate, accurate, and current information is necessary to support a solid waste planning and management system. Minimum informational needs depend upon the detail of planning and the level of management. There must be sufficient information, however, to develop a definitive plan as well as direct and evaluate a management effort. Establishing a management information system can be divided into three main activities—system analysis, system design, and system development.

System Analysis

This entails examination of the system to determine how it works. What is the present informational flow? How can this informational flow be harnessed to provide continuing management data? Because systems analysis requires a detailed knowledge of the organization, department heads and operating personnel should be called upon to participate at the project's beginning. These people contribute to the informational flow of the present system and will ultimately be served by the new MIS.

System Design

In designing the system its purpose must be defined. Why is the system necessary? How do we want the system to work? Who will use the system? Objectives of the system must be determined and stated with design appropriate to achieve these objectives. Advantage should be taken of the information generated by the system. For example, informational flow should be organized and gathered in a systematic way from daily operations of managers and supervisors, from the accounting procedures, from the licensing activity and from the inspection and enforcement program. Other useful sources of information may be revealed during the system analysis.

Typical information needs might include locations and conditions of disposal, reduction, and reclamation facilities; routing schedules; accident types and frequencies; equipment types and conditions; maintenance schedules; costs of collection and processing; inventories of reclaimed materials; and personnel activities. Basically, information needs will resemble the listing in the Plan Report Outline (Part Six). In addition, models, linear programs, regression analysis techniques, decision tree networks, decision grids, and other management tools could be designed into the system to provide it with a more ready-to-serve capacity in everyday operations.

Because of the amounts and complexity of much of the data, computer based systems should be considered to facilitate storage, retrieval, and general data handling. Often the planning or operating jurisdiction will have unused time on its existing computer equipment that can be applied to the solid waste management system. If computers are not immediately available, computer time can be purchased on a time-sharing basis from other governmental agencies or from companies providing this service.

System Development

Implementing the system after it is designed involves establishing procedures for collecting and handling data, purchasing machine or computer time, organizing files, training operators, and any other action steps required. System development can present a complex scheduling and management problem which could be simplified through the use of PERT.

The management information system should be evaluated in terms of its contribution to the planning process and management activity—the adequacy of existing information, the need for further information, and the possible deletion of extraneous information. Although evaluations will occur concurrently with the system's use, a general evaluation and inventory should be conducted annually.

BIBLIOGRAPHY

Cannella, A. A. Queuing analysis applied to a municipal service. Paper, Tennessee Technological University, Aug. 20, 1967, 17 pp.

Clark, R. M. Economics of solid waste investment decisions. *Journal of the Urban Planning and Development Division*, Proc. ASCE, 96(UP1):65-79, Mar. 1970.

Clark, R. M., and B. P. Helms. Decentralized solid waste collection facilities. *Journal of the Sanitary Engineering Division*, Proc. ASCE, 96(SA5):1035-1043, Oct. 1970.

Hartman, W., H. Matthes, and A. Proeme. Management information systems handbook. New York, McGraw-Hill Book Company, 1968.

Harry, H. P., and J. E. Cotton. Program planning for state, county, city. State-Local Finances Project. Washington, George Washington University, Jan. 1967, 72 pp.

Helms, B. P., and R. M. Clark. Locational models for solid waste management. *Journal of the Urban Planning and Development Division*, Proc. ASCE, 97(UP1):1-13, Apr. 1971.

Kito, A. J., and G. A. Garland. Decision trees in solid wastes planning. *Public Works*, 99(7):74-77, July 1968.

Meresman, S. J. PERT: concepts and application to solid waste management. [Cincinnati], U.S. Department of Health, Education and Welfare, 1970. 35 pp.

Thierauf, R. Decision making through operations research. Ed. by R. A. Grosse. New York, John Wiley and Sons, Inc., 1970. 570 pp.

Truitt, M. M., J. C. Liebman, and C. W. Kruse. Mathematical modeling of solid waste collection policies. 2 v. [Washington], U.S. Department of Health, Education, and Welfare, 1970. 289 pp.

PART FIVE: IMPLEMENTATION

Although closely related to planning, implementation is as distinct step marking the apparent end of planning and the beginning of action. In reality, planning never ends, and implementation frequently is necessary and indeed is desirable before the plan is first completed. Therefore, as soon as officials have been prepared to make implementing decisions, they should be encouraged to do so. Making decisions during planning increases interest and some results are immediately apparent. In this document, the concept of implementation will consist of actual program and operating activities, in contrast to those steps and procedures characterized as part of the planning process and described in the Basic Planning Model. Activities critical to implementation include: organization; staffing; financing; acquisition, construction, and management of facilities; acquisition and management of equipment; providing service; public relations; training; continuing planning; and general management and control. Implementation should be carried out according to a schedule and in an order of priority. Responsibility for action, estimated costs, and objectives of the implementation should be specified.

ORGANIZATION

Essential to implementation of a solid waste plan is an organization, an overall jurisdiction with operating divisions and sections. This organization may take many forms, but an areawide agency with maximum operating authority would frequently be advantageous. Various organizational mechanisms, such as utility or authority forms, which offer maximum operating authority characteristics and are readily adaptable to solid waste management operations, should be considered. The organization's divisions and sections should be designed to provide necessary support functions and to carry on an integrated approach to management of storage, collection, transportation, reduction, and disposal, and reclamation. Implementing the organization also should include policy and procedures development and execution; contract management and legal affairs activities; forms, records, and reporting system installation; and establishment of a board of directors and, possibly, an advisory committee. Operating management, as chief executive or administrator and division and section managers, should be appointed first and then overall organizational staffing should proceed.

STAFFING

Present needs and those needs forecasted in the manpower planning section of the plan can guide personnel recruitment and selection. Both adequate selection methods to assure hiring qualified personnel and modern methods of personnel management and industrial relations after hiring should be used.

FINANCING

Methods of capital and operating financing must be established. Funds may be derived from debt instruments, tax levy, revenue produced by operations, or from a combination of these funding methods; proposals for methods of obtaining financial assistance from other agencies also should be included. Budgeting procedures for both capital and operating needs must be installed in the system to provide a long- and short-term financial planning and management tool. Finally, adequate record-keeping systems for financing and budgeting must be installed and maintained. These records should be subsidiaries of the overall accounting system of the operating organization.

ACQUISITION OF FACILITIES

Implementing a solid waste plan will require acquiring, and if necessary developing, facilities; these may include land, buildings, trucks, earthmoving and other equipment. Site location, architectural and engineering design, and construction will be necessary; acceptable equipment performance must be determined and specified before its acquisition; and management must be provided for all facilities and equipment.

PROVIDING SERVICE

Providing collection and disposal service is the primary function of the solid waste organization. In addition, services extend to specifying storage standards and transporting solid waste. Objectives and responsibilities of each operational agency will vary, but additional services might include many of the following:

- Nonresidential wastes generated by hospitals, schools, correctional institutions, and industrial

or commercial concerns might be studied to expand service to include their collection and disposal.

- Areawide solid waste management organizations might provide technical assistance to participating local government, industry, or commercial establishments.
- Equipment, facilities, and storage practices might be inspected under the auspices of State regulation or as part of the local regulatory responsibility.
- Reclamation of materials and recycling might be conducted or sponsored by the solid waste management organization. Sale of reclaimed materials could help offset operating costs or retire debt, and, in other cases, benefit the consumer of solid waste services through lower service costs.

PUBLIC EDUCATION

An active and imaginative public education program is necessary throughout the implementation steps to increase public understanding of and support for good solid waste management practices. It should demonstrate standards of high performance of solid waste management so that the public becomes accustomed to this high performance and continues to demand it; finally, the education program should generally inform the public about how solid waste management relates to the quality of their total environment.

TRAINING

The solid waste operating agency may wish to assess both technical skills currently available for solid waste management and increased technical competencies required in the future. Pre-service and in-service training in solid waste management offers an apparatus for developing needed knowledge and skills. A training program might include such activities as: (1) encouraging management and technical training in colleges and universities (viz., solid waste management courses included in undergraduate, graduate, and extension curriculum); (2) arranging for field courses and demonstrations (such as visiting a sanitary landfill in operation) for public officials, operating personnel, and other interested parties; (3) providing special training for operating personnel to prepare them for certification examinations.

CONTINUED PLANNING

A significant part of the local or regional solid waste management plan should be aimed toward developing a continuing planning program for advancing effective solid waste management. Continuing planning should not be used as a substitute for or a way to delay implementation. This program might include:

- Periodically reviewing and updating the local and regional plan. An inventory system may have to be developed to regularly update the data and evaluate the status of current solid waste management practices. A management information system (MIS) is extremely useful here.
- Periodically assessing the implementation progress of local or regional operations.
- Continuing technical, financial, and legal consultation, guidance, and assistance to participating solid waste management units in the region. This service could also extend to industry, agriculture, and commerce.
- Periodically evaluating the solid waste plan in reference to the overall comprehensive plan of the jurisdiction.

GENERAL MANAGEMENT AND CONTROL

The solid waste management organization will be required to conduct various administrative functions, and procedures should be established for these. Functions typically will include accounting services and billing, fiscal controls, performance evaluations, certification of operators, licensing and franchising, contract management, insurance administration, payroll administration, personnel management, industrial relations, and record keeping.

General management activities also should include drafting, considering, and sponsoring new legislation or ordinances dealing with solid waste management. And administering a planning process support system, such as a management information system, should be part of general management.

Coordination is an important general management activity, and solid waste planning certainly should be coordinated with other operating or planning agencies whose interests or activities may overlap with those related to the development or implementation of the solid waste program. Agencies may include official agencies such as the State or regional planning agencies, the street or highway departments, an industrial commission, and air and water pollution control agencies, as well as a variety of local or unofficial agencies or groups.

A major objective of the grant support authorized by

the 1965 Solid Waste Disposal Act and the 1970 amendment (Resource Recovery Act) is the coordination of solid waste planning with other planning. The solid waste agency not only should consider the agencies with which planning will be coordinated but also indicate the specific ways in which coordination will be assured. Coordination is specifically required with air and water pollution control and land use planning and with planning activities supported with funds provided by Section 701 of the Housing Act of 1954, as amended. Other coordination is required under Office of Management and Budget circular A-95. The Comprehensive Health Planning law (PL 89-749) offers still another opportunity for coordinative effort in resolving areawide problems. Optimally, coordination will aid in developing local or regional plans as well as provide mutual access to planning data and joint promotion of comprehensive plans.

Many State solid waste planning agencies have developed capabilities to extend technical assistance to local or regional solid waste agencies and to review their plans. Although regional or areawide plans should be emphasized, local plans should not be neglected but rather should be tailored and coordinated for inclusion into the larger regional plan. Certain elements, such as operating standards, legislation, and regulations, should be uniform within region and State. To ensure that all planning efforts are effectively coordinated throughout a jurisdiction, the solid waste planning agency should develop and implement its plan with the full support, knowledge, and assistance of pertinent local, regional, and State jurisdictions. Indeed, many of the activities carried out by a solid waste planning agency will require the support and assistance of agencies within these jurisdictions. Examples of coordinated operational organizations were presented in Part Three, Management Considerations.

BIBLIOGRAPHY

[Black, R. J.] Safe and sanitary home refuse storage. Public Health Service Publication No. 1883. Washington, U.S. Government Printing Office. Revised 1962, 1968. 6 pp.

Brunner, D. R., and D. J. Keller. Sanitary landfill design and operation. Washington, U.S. Government Printing Office, 1972. 59 pp.

Canadian Municipal Utilities Staff. Metro Toronto landfill creates many new parks. *Canadian Municipal Utilities*, 99(9):28, Sept. 1961.

DeMarco, J., D. J. Keller, J. Hoekman, and J. L. Newton. Incinerator guidelines–1969. Public Health Service Publication No. 2012. Washington, U.S. Government Printing Office, 1969. 98 pp.

[Gilbertson, W. E., R. J. Black, L. E. Crane, and P. L. Davis.] Solid waste handling in metropolitan areas. Public Health Service Publication No. 1585A. Washington, U.S. Government Printing Office, 1966. 44 l pp.

Gunnerson, C. G. Marine disposal of solid wastes off the west coast. [Cincinnati]. U.S. Department of Health, Education and Welfare, 1970. 32 pp.

Sheaffer, J. R., B. von Bleim, and J. E. Hackett. Refuse disposal needs and practices in Northeastern Illinois with refuse disposal policies for Northeastern Illinois. Technical Report No. 3. Northeastern Illinois Metropolitan Area Planning Commission, June 1963. 72 pp.

Smith, C. D. Municipal refuse–a low-cost resource: sanitary landfill to construct addition to park. *Public Works*, 88(7):94, July 1957.

Sorg, T. J., and H. L. Hickman, Jr. Sanitary landfill facts. 2d ed. Public Health Service Publication No. 1792. Washington, U.S. Government Printing Office, 1970. 30 pp.

Trotter, R. G., D. D. Swavely, W. T. Dehn, and B. L. Sweeney, comps. State solid waste planning grants, agencies, and progress–1970: report of activities through June 30, 1970. Public Health Service Publication No. 2108. Washington, U.S. Government Printing Office, 1971. 26 pp.

Vaughan, R. D. Management of solid wastes from hospitals: problems and technology. *In* Use and disposal of single-use items in health care facilities; report of a national conference, Dec. 4-5, 1968. Monograph No. 6. Ann Arbor, Mich., National Sanitation Foundation, 1969. pp. 441-446.

Weaver, L., and D. Keagy. Manhan, N. D. tries cold-weather operation of sanitary landfill. *American City*, 67(9):111-113, Sept. 1952.

PART SIX: PLAN REPORT PREPARATION

Much of the material presented in the plan report outline at the end of this report is self-explanatory. The content of the foreword or preface, table of contents, and the introduction will depend largely on the specific plan. Thus, this guideline will begin with Section III of the outline, the summary, and proceed through the appendixes.

SUMMARY (SECTION III)

By summarizing the findings and recommendations for quick reference, the plan report can be a more useful working document. The summary ideally is placed at the beginning of the report and is self-contained so that it can be excerpted in its entirety from the plan report, separately reproduced, and used for public information purposes. A special condensation of the summary can serve as public relation materials to gain citizens support.

BACKGROUND OF THE PLANNING AREA AND EXISTING CONDITIONS (SECTION III AND IV) — BASE STUDIES

These sections of the plan document provide the framework for planning and an appraisal of the existing situation, which relies heavily on collection of data (Figure 11, step 2). Attempting to forecast, to determine needs, or to set objectives without data would be futile. The data and information will be diverse and will vary in quantity and quality; only some will be useful for developing a plan. Base Studies (Part Two) outlines in detail data generally required to develop a local or regional solid waste plan. In developing its plan, each jurisdiction should be selective in the data that it uses.

Data collection by the State for the National survey of community solid waste practices will be one important source of information about solid waste handling throughout the State, including: information on storage, collection, reduction, and disposal methods related to particular areas; types and location of disposal and reduction facilities; budgets for solid waste management; population; zoning; and other community information. The information can be retrieved and analyzed for planning on a local, regional, State or National basis.

More detailed and precise data than that provided in the National survey, however, is essential to plan for action programs. All information about solid waste sources and supporting management systems must be gathered to build the needed data base. Additional data about community planning and development have become available in recent years, and these sources should be tapped for data on land use, economics, population, finances, transportation, housing, air and water quality, and the physiography of planning areas.

FUTURE CONDITIONS (PROJECTIONS, SECTION IV)

To determine which conditions will prevail—and to what extent—during the period of the plan requires that existing conditions be analyzed in a future context. The importance of such forecasting cannot be overemphasized. Correct forecasts which identify problems before they occur and permit predetermined solutions is one of the keys to successful planning. Lack of forecasts, or worse, wrong forecasts allow problems to appear without warning or solutions geared to the wrong problems. Statistically correct procedures are important in making forecasts; methodology should, however, be tempered with good judgment. A forecast might be statistically correct, but does it appear reasonable under the circumstances?

When making forecasts, as well as when presenting the forecast data, working forms or tables, presenting comparisons and trends and revealing similarities or differences often are helpful (Form 8). Such forms for forecasting may be used eventually as tables in a plan document. Illustrations, relatively simple charts, graphs, etc., can also aid data presentation considerably. More complicated graphic presentations defeat the basic purpose of conveying information clearly.

OBJECTIVES (SECTION VI)

The basic intent of a solid waste management plan is to solve solid waste problems in the jurisdiction. Each jurisdiction, before beginning any planning, implicitly or explicitly, adopted this overall objective as the main reason for developing a plan at all.

Detailed objectives will emerge as a natural outgrowth of problem definition as data is collected and analyzed during the early stages of the planning process. Objectives—which represent, in effect, the solutions to

FORM 88 PROJECTED REQUIREMENTS FOR SANITARY LANDFILL ACREAGE

County / Region	Population		Per capita generation		Tons generated		Estimated cubic yard fill space	
	current (yr)	projected (yr)	current (yr)	projected (yr)	current	projected	current	projected

the achieved through implementation of the plan should be selected carefully and stated in measurable terms. As a formalized procedure, objectives may be selected by examining each significant solid waste problem discovered in the analysis of existing data. The problem's future relevance should be given, along with a definitive statement of the objective and the proposed strategy (in the form of a recommendation for solution). These solutions require implementation of a plan. The following examples illustrate the procedure.

EXAMPLE 1

Problem Definition. Sixty percent of the Regional Solid Waste Utility's collection vehicle fleet will need replacement during the next 22 years. Further, new vehicles in the fleet experience serious maintenance problems after only 2 years of operation.

Objective. To replace (60) percent of the present collection fleet on an scheduled basis during the next 22 years as well as extend the useful life of new vehicles beyond 2 years.

Constraints. ((1)) No equipment funds budgeted; (2)) no preventative maintenance program; (3)) no equipment replacement plan.

Resources. ((1)) Forty percent of the fleet will remain operable during the next 22 years; (2)) a change from general obligation funding to adequate user charges will provide partial funds; (3)) existing packer truck drivers can perform daily maintenance.

Recommendation for Action (Strategy). ((1)) Budget (capital and operating) for acquisition and operations to include collection vehicle replacement; (2)) develop a proposed user charge schedule; (3)) develop a proposed preventative maintenance program; (4)) develop a proposed schedule for providing 5-year life for vehicles; (5)) present budget proposals and strategy support documents to the utility board of directors during the next budget hearings.

EXAMPLE 2

Problem Definition. According to the solid waste survey conducted during this jurisdiction's planning program, only 15 percent of the jurisdiction's citizens are aware of the need for solid waste disposal facilities.

Objective. Within 1 year, to increase to (60) percent the public informed about the solid waste disposal requirements and the current efforts to provide necessary facilities.

Constraints. ((1)) No public information funds budgeted; (2)) no capability for conducting a public information program; (3)) no specific information to disseminate.

Resources. ((1)) Information is being developed in volume as part of the planning program; (2)) three television stations and five radio stations serving this area probably will provide public service spots free of charge; (3)) some of the agency's professional staff have experience in report writing.

Recommendations for Action (Strategy). ((1)) Budget funds to carry out a 1-year public information program using staff, public service spots in communications media, and publication facilities of the agency; (2)) employ news releases, newsletters, and a speaker's bureau to disseminate information about the

problems of solid waste and the measures being taken to solve these problems.

Any objective developed should be directly related to a specific recommendation for action in the plan. Resources available for achieving objectives and constraints hampering achievement should be identified and assessed. Actually tabulating the problems, the suggested objectives the assessment of constraints and resources, and the possible planned action on a working form might be useful (Form 9). The form takes the approach outlined in examples 11 and 22 and provides space for inserting specific implementing actions, which organize into the recommendations section of the plan report.

RECOMMENDATIONS FOR ACTION (SECTION VII)

The recommendations are essentially the plan strategy. A jurisdiction's intentions and its basic methods for achieving objectives that will help solve its solid waste management problems should be specifically stated and elaborated here. As suggested, a working form can assist in developing this section of the planning report, since recommended solutions to solid waste management problems already have been related to objectives. In addition, however, the recommended solution should be elaborated considerably, with a view to designating major actions required, responsibilities, priorities, timing, locations, estimated costs. A second form (Form 10) would structure and briefly elaborate the recommended planned actions stated in Form 9.

IMPLEMENTATION (SECTION VIII)

Implementation the process of activating the recommendations is described in Part Five.

APPENDICES (FINAL SECTION)

To avoid a cluttered plan text, supporting data, tables, maps, and explanation of methodologies should be placed in appropriate appendices. The material can be referenced in the text with notations or footnotes. This format enhances readability of the text and avoids the possibility that important recommendations may be overlooked. In some jurisdictions, the combined plan text and supporting data might justify two separate report volumes: one would contain data; the other, the plan text, would contain recommendations, priority listings, and schedules. A list of references or a bibliography follows the Appendices.

FORM 9: EVALUATION OF SOLID WASTE MANAGEMENT PLAN OBJECTIVES

Problem definition:

Objective:

Constraints:	Resources:
(1)	(1)
(2)	(2)
(3)	(3)

Recommended action:

FORM 10: SPECIFIC PROBLEM EVALUATION IN PLAN DEVELOPMENT

Statement of Problem:

Recommended Action:

Timing (year)

Priority

Jurisdictional responsibility

Location

Estimated costs

Related problems solved

PLAN REPORT OUTLINE

The basic planning model (Figure 1) can be translated into an outline for the plan text. The format which follows illustrates the logic inherent in the planning procedure. Initiative and innovation are desirable, however, and each jurisdiction is expected to formulate its own systematic outline and report which take into account its particular needs.

SAMPLE OUTLINE FOR REPORTING THE PLAN

[Subheadings illustrate representative and not necessarily specific or comprehensive subjects]

Foreword (or preface (or both))
Contents
(I)* II. Introduction (Purposes of the plan)
III. Summary (This section should be prepared last)
(2) IIII. Background of the planning area (general)—Base studies
AA. Jurisdictions
11. State
22. Regions
33. Planning areas
44. Metropolitan areas
55. Council of Government (COG) jurisdictions
66. Counties
77. Municipalities
88. Special districts
99. Other
BB. Physical conditions
11. Environmental conditions
22. Geology and soils
33. Climatology
44. Drainage basins
55. Other
(2) IIV. Existing conditions (specific)—Base studies
AA. Data arranged according to specific needs of the planning agency. (Data collected for the National survey of community solid waste practices is the basic source for this plan section, but must be augmented by other types of information.)
BB. Description and analysis of all existing conditions affecting management of municipal, industrial, agricultural, and mineral wastes, etc.
11. Storage, collection, and transportation practices
22. Disposal and reduction facilities
33. Quantities of wastes collected, disposed of, and generated, along with generation rates
44. General management practices (e.g., utilization)
55. Population (size and densities)
66. Housing (types and locations)
77. Land uses (residential, commercial, industrial, agricultural, extractive, recreational, and other relevant land uses)
88. Transportation corridors
99. Levels of acceptability, service costs, and other relevant State, regional, and community conditions
1010. Public awareness and knowledge about solid waste problems and service requirements
1111. Expenditures for solid waste management
1122. Tax base (assessed valuations)
1133. Tax rates
1144. Public finance practices
1155. Status of legislation
1166. Economic base
1177. Other

*Parenthetical arabic numerals refer to corresponding steps in the Basic Planning Model, Figure 11.

((39) V. Future conditions and problem definition

A. Relevancy for the future. (From the analysis of the data on existing conditions accumulated in sections III and IV, determine which conditions will have future ramifications))

B. Future problems defined

1. Types
2. Locations
3. Extent
4. Persistence
5. Control difficulties
6. Other

C. Forecast of all existing conditions and problems bearing upon the future

((41.5)(41) VI. Clearly stated objectives based upon need to solve the problems defined earlier

A. Provision of acceptable methods of waste disposal

B. Acceptable collection and transportation methods

C. Development of better trained solid waste management personnel (operating and management levels)

D. Better informed public regarding solid waste problems and service requirements

E. Provision of sufficient legal and financial support

F. Development of solid waste management organizational structure

G. Other

((7.58) VII. Recommendations for action (the plan)

A. What and how the jurisdiction intends to accomplish to solve its solid waste management problems

1. Timing and priorities of intended action (short- and long-term objectives))
2. Location of intended action
3. Who should act (i.e., agency, department)
4. Estimated costs
5. Problems that will be solved
6. Other

B. Aspects to be considered as intended plan action. (Proposals for action should be accompanied by procedures for accomplishment and schedule for initiation of action))

1. Development of rules and regulations
2. Inspection and enforcement
3. Licensing of facilities
4. Training programs
5. Technical assistance to operating units
6. Design planning
7. Site location
8. Site acquisition
9. Transfer station construction
10. Incinerator construction
11. Sanitary landfill construction
12. Truck acquisition
13. Reclamation station development
14. Organizational formation
15. Certification of operating personnel
16. Public information and education program
17. Development of budgeting procedures, financing, cost-effectiveness, special charge features, and other operating management features
18. Development of solid waste management operating departments and jurisdictions
19. Recruitment, selection, and hiring of solid waste management operating personnel

(89) VIII. Implementation (occurs outside the plan document but is guided by it; see Part Five for a description of implementing activities))

Appendices (supporting materials and information, such as charts, additional tables, legislation and regulations, definition of terms, or methodologies of research and analyses, used to develop the analyses, objectives, and plan))

References to the solid waste literature.

WDO 7/22/2117/35